3107

N° 22,731 A.D. 1900

Date of Application, 13th Dec., 1900
Complete Specification Left, 12th Sept., 1901—Accepted, 2nd Nov., 1901

PROVISIONAL SPECIFICATION.

Improved Means for Increasing the Efficiency of High Tension Electric Influence Machines.

FREDERICK TUDSBURY Electrician Edwinstowe Newark, in the County of Nottingham do hereby declare the nature of this invention to be as follows:—

I accomplish this by enclosing the machine in an airtight case of metal or other suitable material, into which atmospheric air or other gas or gases are compressed; The machine being worked by suitable driving gear, and the electric current conveyed to the exterior through insulated conductors.

The higher the pressure of the atmospheric air gas or gases, the greater becomes the electrical efficiency of the machine.

Dated this 12th day of December 1900

FREDERICK TUDSBURY.

COMPLETE SPECIFICATION.

"Improved Means for Increasing the Efficiency of High Tension Electric Influence Machines".

I, FREDERICK TUDSBURY, of Edwinstowe, Newark, in the County of Nottingham, Electrician, do hereby declare the nature of my said invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention is applicable to various types of high tension electrical machines, such as the Wimshurst, the Voss and the Holtz machines, which are largely employed where electrical installations are inacessible, by my invention the power generated by this type of machine may be largely increased and intensified, rendering them more portable by reason of a comparatively small machine being raised to an equivalent power of a very much larger and less portable machine, and therefore more valuable for certain purposes than many other forms of electrical appliance, as for example in connection with the X rays and other medical purposes now so largely used in field hospitals, in wireless telegraphy, in ignition for lighting, shot firing and the like purposes.

I carry out my invention in the following manner.

The general features of my invention will be more clearly understood on reference to the accompanying sheet of drawings which illustrate one form of its application, and I wish it to be understood that I do not confine myself thereto

Fig. 1, is an elevation partly in section, and Fig. 2, is a horizontal section or sectional plan, in which the same letters refer to similar parts, of a two plate Wimshurst Induction Machine enclosed in an air or gas tight case, *a*, of metal or other suitable material capable of withstanding considerable internal pres-

[*Price* 8*d*.]

sure, into which atmospheric air, gas or gases, or combination of air and gas or gases, is compressed by means of a force pump or other equivalent at not less than 15 lbs per square inch through the air valve, *b*.

The machine is worked by suitable driving gear, *k*, k^1, k^2, k^3, k^4, and the electric current is conveyed to the exterior of the case through insulated conductors, *e*, *e*. the driving gear spindle is passed into the interior of the case through a stuffing box, *c*, the main spindle, *g*, on which the machine discs revolve also forms a central stay for the casing of the machine; *d* and d^1, are the ebonite discs. and *i*, i^1, i^2, and i^3, are neutralizing brushes, *j*, is a drying medium, and *h*, is an ebonite insulating cylinder, *l*, *l*, are sectors on the discs *d*, d^1.

I have found by experiment that the higher the pressure of the atmospheric air, gas or gases to which the machine is subjected inside the case the greater becomes its electrical efficiency, as for example.

The length of spark of an ordinary Wimshurst machine with 8″ inch discs would not, as ordinarily constructed exceed $2\frac{1}{2}$ inches, but when the pressure in the case was raised up to 15 lbs to the square inch, a 6 inch spark was obtained. When the pressure was raised to 30 lbs per square inch, a 9 inch spark was obtained, thereby enabling an 8 inch machine under this pressure to do the work of a 20 inch machine at atmospheric pressure.

Having now particularly described and ascertained the nature of my invention and in what manner the same is to be performed I declare that what I claim is,

1. Improved means for increasing the efficiency of high tension electric influence machines, comprising a strong air tight or gas tight receptacle supplied with highly compressed gas or air, said receptacle containing said electric influence machine, substantially as described.

2. The combination of a device of the kind described comprising an air or gas tight receptacle, an electric influence machine contained therein, and means for highly compressing gas or air into said receptacle, substantially as described.

3. The combination of a strong air or gas tight receptacle, means for highly compressing air or gas, or a combination of gases into said receptacle, and an electric influence machine contained within said receptacle, substantially as described.

4. In a device of the character described, the combination of a strong air or gas tight receptacle, an electric influence machine contained therein, means for highly compressing air or gas into said receptacle, and means for conveying the electric current to the exterior of said receptacle, substantially as described.

Dated this 11th day of September 1901.

R. HEBER RADFORD
Agent for the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Malcomson & Co., Ltd.—1901.

22,731

A.D. 1910, Dec. 13. N° 22,731.

TUDSBURY'S Complete Specification.

[1 SHEET]

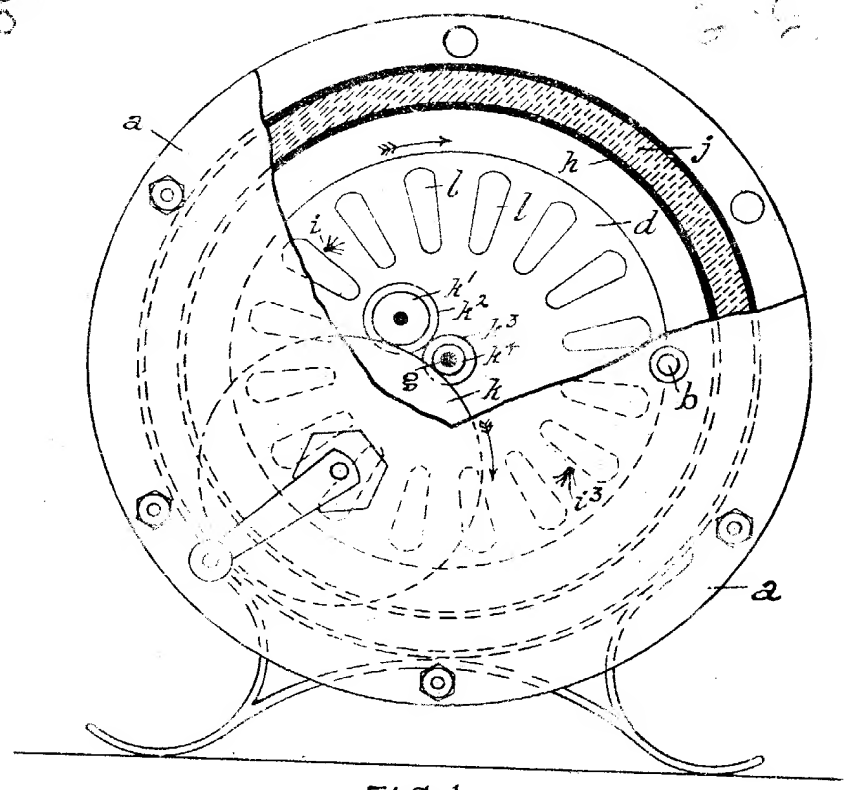

FIG. 1.

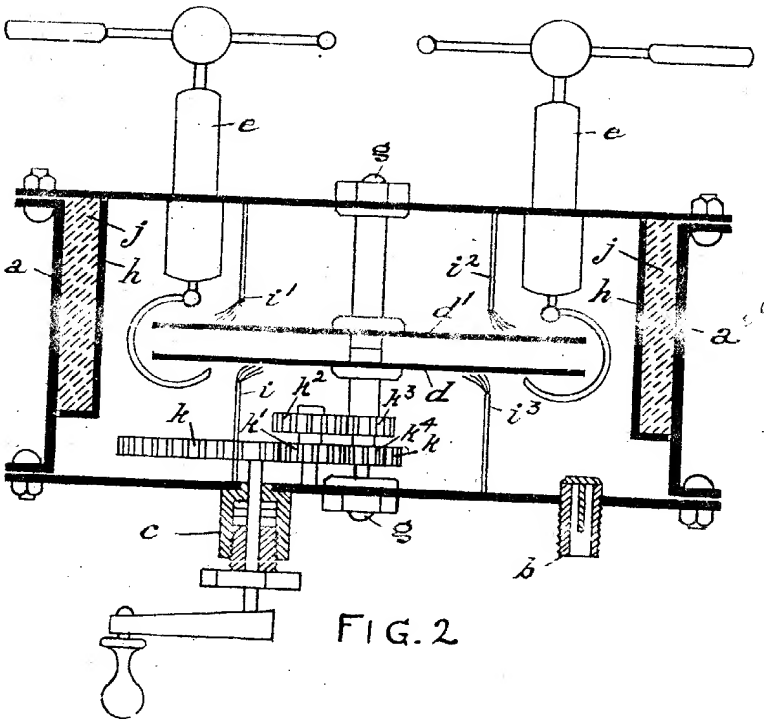

FIG. 2.

[This Drawing is a reproduction of the Original on a reduced scale.]

Malby & Sons, Photo-Lith.

Physics

Hans C. Ohanian

UNION COLLEGE AND

RENSSELAER POLYTECHNIC INSTITUTE

W · W · NORTON & COMPANY

NEW YORK · LONDON

Printed in the United States of America.
First Edition

Book design by Antonina Krass
Makeup by Roberta Flechner
Production editor Frederick E. Bidgood
Picture research by Amy Bocsky and Natalie Goldstein

Library of Congress Cataloging in Publication Data

Ohanian, Hans C.
Physics.

Includes index.
1. Physics. I. Title.
QC21.2.037 1985 530 84-25540
ISBN 0-393-95401-3

W. W. Norton & Company, Inc., 500 Fifth Avenue, New York, N.Y. 10110
W. W. Norton & Company Ltd., 37 Great Russell Street, London WC1B 3NU

3 4 5 6 7 8 9 0

much as 10^{-9} to 10^{-8} coulomb per square centimeter. If the charge concentration on a body is higher than that, it will cause an electrical discharge into the surrounding air (a corona discharge; see Section 1.4); a higher charge concentration can subsist only on a small body or on a small spot on a large body.

Induction

Once we have accumulated some charge on, say, a rod of glass, we can produce charges on other bodies by a process of **induction,** as follows: First we bring the glass rod near a metallic body supported on an insulating stand. The positive charge on the rod will then attract free electrons to the near side of the body and leave a deficit of free electrons on the far side (Figure 22.7a); thus, the near side will acquire negative charge and the far side positive charge. If we next momentarily connect the far side to the ground, the positive charge will be neutralized by an influx of electrons from the ground (virtually, the positive charge leaks away; Figure 22.7b). This leaves the metallic body with a net negative charge. When we finally withdraw the glass rod, this charge will remain on the metallic body, distributing itself over its entire surface (Figure 22.7c).

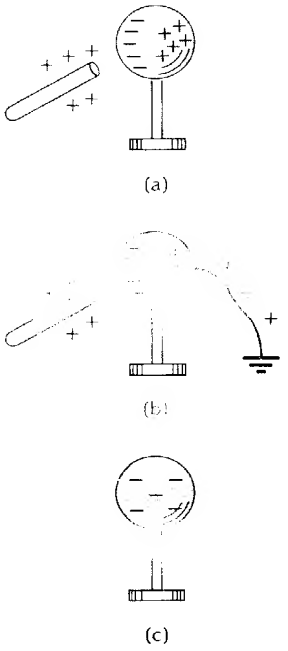

Fig. 22.7 (a) The positively charged glass rod induces a charge distribution on the metallic sphere. (b) When the far side of the sphere is connected to the ground by means of a wire, the positive charge leaks away. (c) Finally, only negative charge remains on the sphere.

Some old electrostatic machines accumulate large amounts of charge by a repetitive operation of induction. Figure 22.8 illustrates the principle. Two metallic bodies on insulating stands (A and A') initially carry some small positive and negative charges. In order to increase these charges, we place two small metallic bodies B and B' nearby. Charges will then be induced on B and B', as shown in Figure 22.8a. If we now momentarily connect the far sides of B and B' with a wire, the charges on these sides will cancel, leaving B with a negative charge and B' with a positive charge (Figure 22.8b). Next, we put B' in contact with A and B in contact with A' (Figure 22.8c); this transfers the charges of the small bodies almost entirely to the larger bodies. The small bodies are

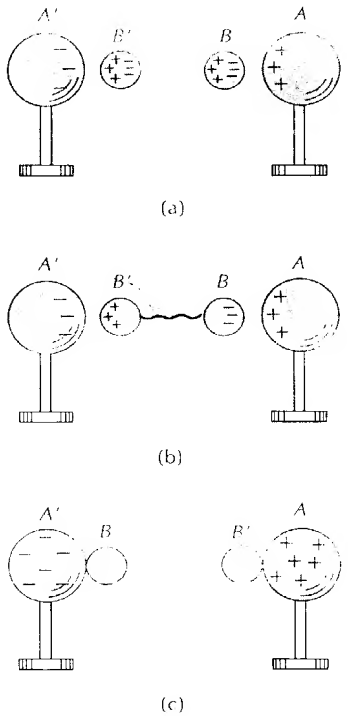

Fig. 22.8 (a) The large spheres induce charge distributions on the small spheres. (b) When the neighboring sides of the small spheres are connected by means of a wire, the charges of these sides cancel. (c) The large spheres absorb the charge of the small spheres.